"From functionalization to self-assembly of π-conjugated materials"

Abstract:
Conjugated polymers are plastics that can be designed to absorb/emit light and conduct electrical currents. Their versatile chemical synthesis, their processability from solution at low temperatures, as well as their mechanical flexibility make them ideal candidate materials in flexible organic electronic devices such as light-emitting diodes, field-effect transistors, optical sensors and solar cells. Since device performance depends on both the optoelectronic properties and nanoscale morphology of the polymer (which are intrinsically linked), controlling the polymer structure and understanding the parameters and physical processes influencing the polymer morphology and its interdependent optoelectronic properties are of crucial importance for developing highly effective devices.

In this talk, recent progress from our group towards the well-controlled synthesis of π-conjugated polymers will be presented. We will then discuss how the conformation of these polymers and their optical and electronic properties can be manipulated through self-assembly strategies exploiting non covalent interactions such as π-π stacking or halogen bonding. Then, we will describe the preparation of conjugated polyelectrolytes. Their self-assembly with DNA and their use as cathode interfacial layer in solar cells will be discussed. Finally, we will present how these polymers can be mixed with metal oxide leading to homogeneous organic-inorganic hybrid materials through the use of non covalent interactions or interface modification.

Keywords: π-conjugated materials, self-assembly, polyelectrolytes, solar cells, hybrid materials